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Carcinogen Risk Assessment of Mutagen X in Chlorinated Drinking Water in West of Tehran, Using Probabilistic Approaches

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ABSTRACT: The present study aims at evaluating the risk of Mutagen X (MX) (3-chloro-4-(dichloromethyl)-5-hydroxy-2 (5H)-furanone) and adverse health effects, associated with direct ingestion of chlorinated drinking water in west of Tehran, supplied by chlorinated drinking water from surface and underground water sources. For one year, MX concentrations in tap water samples has been measured for consumers in four different zones in western Tehran. It has been found that average MX concentration in the whole study area is 24.16 ng/L, with the highest concentration being in Zone 1 with a value of 38 ng/L. Also, the role of water sources, seasonal changes, and effective factors such as Total Organic Carbon (TOC) have been evaluated on MX formation. The highest of excess lifetime cancer risk (ELCR), estimated as 0.0037E-05, belongs to Zone 1, which uses surface water to supply drinking water, while the lowest can be seen in Zone 4, being 0.0021E-05. This latter zone utilizes underground water as the water source. In all zones, the highest risk of excessive cancer is related to winter, ranging from 0.0045E-5 in Zone 1 to 0.0023E-5 in Zone 4. The estimated number of cancer cases for Zones 1 to 4 have been 0.012, 0.016, 0.016, and 0.004, respectively, based on their population. The estimated average risk and the number of ELCR, caused by exposure to MX, through direct ingestion of drinking water have been 0.0030E-5 and 0.047, respectively, in the entire studied area for the duration of one year.

Keywords: Drinking water, Chlorination, Mutagen X, Risk assessment, Uncertainties, Tehran, Iran.

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